What Is Claimed Is:

1. A method of multi-resolution vector quantization for audio encoding, characterized in that it comprises the steps of: adaptively filtering an input audio signal so as to gain a time-frequency filter coefficient and outputting a filtered signal; dividing vectors of the filtered signal in a time-frequency plane so as to gain a vector combination; selecting vectors to be quantized; quantizing the selected vectors and calculating a residual error of quantization; and transmitting a quantized codebook information as a side-information of an encoder to an audio decoder to quantize and encode the residual error of quantization.

2. The method of multi-resolution vector quantization for audio encoding of claim 1, wherein the procedure of said adaptively filtering an audio signal further comprises: decomposing the input audio signal into frames and calculating a transient measure of a signal frame; discriminating whether a type of a current signal frame is a graded signal or a fast-varying signal by comparing a value of the transient measure with a value of a threshold; if it is the graded signal, then proceeding a cosine modulation filtering with equal bandwidth to gain a filter coefficient in a time-frequency plane and output the filtered signal; if it is a fast-varying signal, then proceeding a cosine modulation filtering with equal bandwidth to gain a filter coefficient in a time-frequency plane, analyzing the filter coefficient in multi-resolution by a wavelet transform, adjusting a time-frequency resolution of the filter coefficient, and finally outputting the filtered signal.

3. The method of multi-resolution vector quantization for audio encoding of claim 2, wherein the cosine modulation filtering adopts a traditional cosine modulation filtering or a modified discrete cosine transform filtering.

4. The method of multi-resolution vector quantization for audio encoding of claim 3, wherein the cosine modulation filtering further comprises a Fast Fourier Transform.

5. The method of multi-resolution vector quantization for audio encoding of claim 2, wherein if it is the fast-varying signal, the procedure further comprises: subdividing the fast-varying signal into the fast-varying signal of various types and processing filtering and multi-resolution analysis respectively for different types of the fast-varying signal.

6. The method of multi-resolution vector quantization for audio encoding of claim 5, wherein a wavelet base of a wavelet transform during said processing multi-resolution analysis is fixed or adaptive for different types of the fast-varying signal.

7. The method of multi-resolution vector quantization for audio encoding of claim 1, wherein dividing vectors of the filtered signal in a time-frequency plane includes three methods: dividing in a time direction, in a frequency direction and in a time-frequency area;

said dividing in a time direction further includes keeping a resolution in the frequency direction unvaried and dividing time so as to make the number of divided vectors to be N/D and gain a I type vector array, wherein N means a length of a frequency coefficient of the audio signal, and D means dimensions of a vector;

said dividing in frequency direction further includes keeping a resolution in the time direction unvaried and dividing a frequency to make the number of divided vectors to be N/D and gain a II type vector array, wherein N means a length of a frequency coefficient of the audio signal, and D means dimensions of a vector;

said dividing in time-frequency area further includes dividing time and a frequency in the time-frequency plane to make the number of divided vectors to be N/D and gain a III type vector array, wherein N means a length of a frequency coefficient of the audio signal, and D means dimensions of a vector;

8. The method of multi-resolution vector quantization for audio encoding of claim 1, wherein the procedure of said selecting vectors to be quantized further includes:

discriminating whether it is necessary to quantize all the vectors in the time-frequency plane, if yes, respectively calculating quantization gains of a I type vector array, a II type vector array and a III type vector array and selecting vectors in the vector array with a largest value of the quantization gain as the vectors to be quantized; else selecting M vectors to be quantized and encoding serial numbers of selected vectors.

9. The method of multi-resolution vector quantization for audio encoding of claim 8, wherein the procedure of said selecting M vectors to be quantized further includes: forming a vector aggregate from the vectors in the I type vector array, the II type vector array and the III type vector array; calculating an energy of each vector in said vector aggregate, i.e. square of the coefficient, as well as calculating a variance of each component of each vector sorting the vectors in the vector aggregate by the energy from the biggest to the smallest; re-sorting the above sorted vectors by the variance from the smallest to the biggest; determining the number M of vectors to be selected according to the ratio of a total energy of the signal to the total energy of the currently selected vectors, and selecting first M vectors to be the vectors to be quantized; if the vectors in a same area are included in the I type vector array, the II type vector array and the III type vector array at the same time making selection according to the ordering of the variance.

10. The method of multi-resolution vector quantization for audio encoding of claim 8, wherein the procedure of said selecting M vectors to be quantized further includes: forming a vector aggregate from the vectors of the I type vector array, the II type vector array and the III type vector array ; calculating an energy of each vector in said vector aggregate and an encoding gain; selecting a first M vectors with the biggest encoding gain to make the energy of the selected M vectors over 50% of a total energy.

11. The method of multi-resolution vector quantization for audio encoding of claim 9 or 10, wherein a numerical value of said M can be any integer from 3 to 50.

12. The method of multi-resolution vector quantization for audio encoding of claim 1, wherein the procedure of said quantizing the selected vectors further comprises: calculating an energy value of each area of the time-frequency plane or a absolute maximum; defining a global normalization factor; normalizing the selected vectors; calculating a local normalization factor of the vector and normalizing at second time; quantizing normalized vectors and calculating a residual error of quantization.

13. The method of multi-resolution vector quantization for audio encoding of claim 12, wherein the procedure of said quantizing the selected vectors further comprises: calculating the energy value of each area of the time-frequency plane or the absolute maximum ; forming a Unary Function Y=f(X), wherein X represents a serial number of an area, and Y represents the energy or the absolute maximum corresponding to area X; defining a global gain according to the total energy of the signal and quantizing and encoding it by a logarithm model; normalizing the selected vectors by the global gain; calculating the local normalization factor of a current vector according to Taylor Formula and normalizing the current vector once again; obtaining a general normalization factor of the current vector to be a product of the above two normalization factors; forming a M-dimensional vector by a function value of the selected M areas; calculating a first-order difference and a second-order difference corresponding to the vector; obtaining codebooks of the above three vectors by Codebook Training Algorithm and quantizing the above three vectors; quantization of the vectors corresponding to a zero-order approximate expression of Taylor Formula, and adopting an Euclidean distance for a distortion measure in codebook searching; quantization of the vector of the first-order difference corresponding to a first-order approximation of Taylor Formula, searching a few code words with the least distortion of the corresponding codebook according to the Euclidean distance, then calculating a quantization distortion of each area of a small neighborhood at the current vector x_0 , at last summing up the distortion to be the distortion measure; quantization of the

vector of the second-order difference being similar with the quantization of the vector of the first-order difference.

14. The method of multi-resolution vector quantization for audio encoding of claim 12, wherein the procedure of said quantizing the selected vectors further comprises: calculating the energy value of each area of the time-frequency plane or the absolute maximum ; forming a Unary Function Y=f(X), wherein X represents a serial number of an area, and Y represents the energy or the absolute maximum corresponding to area X; defining a global gain according to the total energy of the signal and quantizing and coding it by a logarithm model; normalizing the selected vectors by the global gain; calculating the local normalization factor of a current vector according to a Spline Curve Fitting Formula and normalizing the current vector once again; forming a M-dimensional vector by a function value of the selected M areas and the vector being able to be decomposed into several component vectors which are called vectors of selected points; quantizing the above vectors separately.

15. A method of multi-resolution vector quantization for audio decoding, characterized in that it comprises the following steps of: demultiplexing a code stream to gain a side information of the multi-resolution vector quantization , an energy of a selected point and location information of vector quantization; inverse quantizing vectors to obtain a normalized vector according to the above information and calculating a normalization factor to rebuild a quantized vector in an original time-frequency plane; adding the rebuilt vector to a residual error of a corresponding time-frequency coefficient according to the location information; obtaining a rebuilt audio signal by inverse filtering in multi-resolution and mapping from frequency to time.

16. The method of multi-resolution vector quantization for audio decoding of claim 15, wherein the step of said rebuilding a quantized vector in an original time-frequency plane further comprises: calculating an energy and values of each order difference of each selected point from a codebook according to the side information; obtaining the

location information of vector quantization in the time-frequency plane and a global normalization factor from the code stream; obtaining a normalization factor at second time in the corresponding position in accordance with a formula used in encoding process to calculate a normalization factor at second time; obtaining the normalized vector according to a vector quantization index, multiplying the normalized vector with the above two normalization factors to rebuild a quantized vector in a time-frequency plane.

17. The method of multi-resolution vector quantization for audio decoding of claim 15, wherein the procedure of said inverse filtering in multi-resolution further comprises: organizing a time-frequency for the time-frequency coefficient of the rebuilt vector, performing following filtering according to types of signals obtained from decoding: if it is a graded signal, proceeding a cosine modulation filtering with equal bandwidth to gain a pulse code modulation output in a time domain; if it is a fast-varying signal, integrating in multi-resolution and proceeding a cosine modulation filtering with equal bandwidth to gain a pulse code modulation output in a time domain.

18. The method of multi-resolution vector quantization for audio decoding of claim 17, wherein the fast-varying signal can be further divided into various types of the fast-varying signal, integrating in multi-resolution and filtering are respectively performed to different types of the fast-varying signal.

19. A device of multi-resolution vector quantization for audio encoding, characterized in that it comprises: a time-frequency mapper, a multi-resolution filter, a multi-resolution vector quantizer, a psychological acoustic calculation module and a quantization encoder;

the time-frequency mapper for receiving an input audio signal to process mapping from time to frequency domain and output to the multi-resolution filter;

the multi-resolution filter foradaptively filtering the signal, and outputting a filtered signal to the psychological acoustic calculation module and the multi-resolution vector

quantizer;

the multi-resolution vector quantizer for vector quantizing the filtered signal and calculating a residual error of quantization, transmitting a quantized signal as a side information to an audio decoder and outputting the residual error of quantization to the quantization encoder;

the psychological acoustic calculation module for calculating a masking threshold of a psychological acoustic model according to the input audio signal, and outputting the masking threshold to the quantization encoder so as to control noise allowed in quantization ;

the quantization encoder for quantizing and entropy coding the residual error output by the multi-resolution vector quantizer to gain an encoded code stream information under restriction of the allowed noise output by the psychological acoustic calculation module.

20. The device of multi-resolution vector quantization for audio encoding of claim 19, wherein the multi-resolution filter comprises a transient measure calculation module, M equal bandwidth cosine modulation filters , N multi-resolution analyzing modules and time-frequency filter coefficient organization modules, and satisfying M=N+1;

the transient measure calculation module for calculating a transient measure of an input audio signal frame to determine a type of the signal frame;

the equal bandwidth cosine modulation filters for filtering the signal to gain a filter coefficient; if the signal is a graded signal, outputting the filter coefficient to the time-frequency filter coefficient organization module; if the signal is a fast-varying signal, transmitting the filter coefficient to the multi-resolution analyzing module;

the multi-resolution analyzing module for performing wavelet transform to the filter coefficient of the fast-varying signal, adjusting a time-frequency resolution of the coefficient, outputting a transformed coefficient to the time-frequency filter coefficient

organization module;

the time-frequency filter coefficient organization module for organizing filtered output coefficients in a time-frequency plane and outputting the filtered signal.

21. The device of multi-resolution vector quantization for audio encoding of claim 19, wherein the multi-resolution vector quantizer comprises: a vector organization module, a vector selection module, a global normalization module, a local normalization module and a quantization module;

the vector organization module for organizing coefficients in the time-frequency plane output by the multi-resolution filter according to different dividing policies into a vector form, and outputting the vector to the vector selection module;

the vector selection module for selecting vectors to be quantized according to energy etc factors, and outputting the vectors to be quantized to the global normalized module;

the global normalized module for globally normalizing the vectors;

the local normalized for calculating a local normalization factor of each vector locally normalizing vectors output by the global normalized module and outputting to the quantization module;

the quantization module for quantizing vectors which are normalized at twice, and calculating the residual error of quantization.

22. A device of multi-resolution vector quantization for audio decoding, characterized in that it comprises: a decoding and inverse--quantizing device, a multi-resolution inverse-vector quantizer, a multi-resolution inverse filter and a frequency-time mapper;

the decoding and inverse -quantizing device for demultiplexing , entropy decoding and inverse -quantizing a code stream to obtain a side information and encoding data and outputting to the multi-resolution inverse-vector quantizer;

the multi-resolution inverse-vector quantizer for quantizing a inverse-vector to

rebuild a quantized vector, adding a rebuilt vector to a residual coefficient of a time-frequency plane and outputting to the multi-resolution inverse filter;

the multi-resolution inverse filter for inverse filtering the vector rebuilt by the multi-resolution vector quantizer and outputting to the frequency-time mapper;

the frequency-time mapper for mapping a signal from frequency to time to obtain a final rebuilt audio signal.

23. The device of multi-resolution vector quantization for audio decoding of claim 22, wherein the multi-resolution inverse-vector quantizer comprises: a demultiplexing module, an inverse-quantizing module, a normalized vector calculation module, a vector rebuilding module and an addition module.

the demultiplexing module for demultiplexing a received code stream to obtain a normalization factor and a quantization index of a selected point;

the counter-quantized module for obtaining an energy envelope and location information of vector quantization according to the information output from the demultiplexing module, inverse-quantizing to obtain a vector of a guide point and a selected point, calculating a second normalization factor and outputting to the normalized vector calculation module;

the normalized vector calculation module for inverse-normalizing the vector of the selected point to obtain a normalized vector, and outputting to the vector rebuilding module;

the vector rebuilding module for inverse-normalizing the normalized vector once again according to the energy envelope to obtain the rebuilt vector;

the addition module for adding the rebuilt vector output from the vector rebuilding module to a residual error of inverse-quantization in the corresponding time-frequency plane to obtain an inverse-quantized time-frequency coefficient as an input of the multi-resolution inverse filter.

24. The device of multi-resolution vector quantization for audio decoding of claim

22, wherein the multi-resolution inverse filter further comprises: a time-frequency coefficient organization module, N multi-resolution integration modules and M equal bandwidth cosine modulation filters , satisfying M=N+1;

the time-frequency coefficient organization module for organizing inverse-quantized coefficients by filter input method, if a graded signal, inputting to the equal bandwidth cosine modulation filters ; if a fast-varying signal, outputting to the multi-resolution integration module;

the multi-resolution integration module for mapping a multi-resolution time-frequency coefficient to be a cosine modulation filter coefficient with equal bandwidth, and outputting to the equal bandwidth cosine modulation filters;

the equal bandwidth cosine modulation filters for filtering the signal to obtain a pulse coding modulation output in time domain.